Result Page

Welding method and welding set for the execution of the welding method the invention relates to a method and an apparatus for the arc welding after the preambles of the claims I and 20.

From the EP 0,904,883 AI a method is for igniting and known to the maintenance of an arc for the arc welding. The supply of the arc and/or. the Zündvorgang made over a regulated power source. The welding wire becomes moved toward the workpiece up to, thus up to the formation of a shortcircuit, whereby the subsequent welding wire with energy of the power source takes precautions becomes. Subsequent one becomes the welding wire away from the workpiece moved, so that by lifting of the welding wire of the workpiece, thus by the resolution of the shortcircuit, which becomes arc ignited. The backward motion of the welding wire of the workpiece becomes continued until a corresponding arc-prolonged is achieved, on which the movement of the welding wire becomes reverse toward the workpiece, thus into a forward movement. At this time the ignition procedure of the arc completed is, like that dal3 by a continuous forward movement toward the workpiece a welding process performed will can, whereby applied with occurrence of a shortcircuit, thus when accumulating the welding wire on the surface of the workpiece, a higher current pulse than the set welding current becomes to the welding wire, so that melt opens of the shortcircuit and thus a metal drop separation becomes achieved. However the forward movement of the welding wire is maintained.

Adverse one is here that it comes by the increase of the welding current into form of a current pulse to melting of the Metalltropfens with due to the high current intensity to the time of the disruption of the shortcircuit welding splash develops.

The current invention is the basis the object to create a method and an apparatus for igniting and maintaining an arc becomes substantially improved with which the welding quality of the welding process.

This object of the invention becomes by the characteristic measures of the claim I achieved. Favourable it is here that the process flow becomes so controlled that with an arising shortcircuit between the welding wire and the workpiece in the completed ignition procedure adjusting on the advancing movement, thus on the forward movement, the welding wire is influenced, whereby the forward movement briefly stopped and/or reverse will and so that the shortcircuit is waived. Thus achieved that is possible thereby an automatic constant of the welding current, will be omitted thus a current increase, how it is usually required to the disruption of a shortcircuit, can.

Thereby is omitted also welding splash which arises with a disruption of the shortcircuit by current increase inevitably, whereby incorrect, careless welding results become effective avoided. An other advantage lies in the fact that also with thick wires of relatively small welds complete splash-free achieved to become to be able and with thin wires so called microweldings on very much thin sheets made to become be able. This is only therefore possible, since the detachment of the formed Metalltropfens does not become any more with a very high current pulse generated, but the detachment by the backward motion of the welding wire and the surface tension of the molten bath performed becomes.

From advantage it is in the measures after the claims 2 to 11 that can become performed thereby without large tax or rule expenditure a splash-free welding method.

Favourably thereby also measures are as in claims 12 to 14 described, because thereby process dependent predetermined parameters of the control at the basis placed becomes to become to be able and a rapid reaction possible required to the control of such processes.

By the regulated influencing control on the advancing movement of the welding wire bottom consideration of the predetermined process parameters the warm bringing in becomes smaller held substantial after these measures compared with from the state of the art prior art method, whereby this method is suitable in particular also for a welding process of very much thin materials and the formation of the apparatuses becomes the filler rod supply by the applicability of welding wires with larger cross section simplified.

In accordance with the favourably other measures as in the claims 15 and 16 described, the applicability of the method for all becomes the state of the art of formed welding sets achieved and thus the broad spectrum of the different applications covered.

Finally also measures are as in the claims 17 to 19 described of advantage, because by it the required short response time with the drive of the drive that Feed device and in particular the rapid reversal of the direction of movement of the welding wire achieved become.

In addition, the object of the invention becomes 20 achieved by the characterizing features of the claim. Surprising advantage thereby is that by a reversal of the drive of the feed device and thus the direction of movement of the welding wire the periodic arising short-circuit phases during the welding process, which always then occur, if a melting part, in particular the Metalltropfens, changes the welding wire into the weld pool are waived, without

corrections in the relative position of the welding torch become the workpiece required. Thus are in addition, Stromerhö hungsmassnahmen not required to the disruption of a shortcircuit, which cause mostly also welding splashes and the welding result negative affect.

From advantage 21 described thereby also an embodiment is as in the claim, since can become made with a drive by means of servomotor a very rapid reversal.

In addition, an other favourable formation describes claim 22, because thereby inexpensive, commercial apparatuses are more insertable.

In accordance with the favourable development as in claim 23 described, result a variety of alternatives for the drive of a such feed device for the welding wire.

After the other favourable formation as in the claim 24 described, an high precision of the feed device achieved becomes and is suitable particularly this embodiment for the use within the micro welding range, D. h., where it particularly depends on very exact control flows whole.

In addition, finally an embodiment is 26 described possible as in the claims 25 and, whereby a very inexpensive formation is bottom use of small trouble-prone components possible.

The better understanding of the invention this on the basis in the subsequent figs described embodiments more near explained becomes.

Show: Fig. 1 a schematic illustration of a welding set with the single Kompo nenten in more simplified, schematic illustration; Fig. 2 a simplified block diagram for the execution of the according to invention
Welding method with a welding set according to invention; Fig. 3 a diagram with the feed process of the welding wire for the execution of the invention process; Fig. 4 a diagram over the potential gradient at the time of the execution of the invention in accordance with-eaten method; Fig. 5 a diagram of a current process at the time of the execution of the according to invention
Method; Fig. 6 a diagram of an other variant of the current process at the time of the execution of the invention process; Fig. 7 a diagram of another possible current process at the time of the execution of the invention process; Fig. 8 an embodiment of a feed device for the welding wire erfin would dung-in accordance with-eat welding set in view; Fig. 9 another embodiment of the feed device for the welding wire for the welding set according to invention in view; Fig. 10 an other embodiment of the feed device for the welding wire for the welding set according to invention in view; Fig. 11 a schematic diagram to the drive of the drive feedbefore direction for the welding wire of the welding set according to invention.

Held is introductory that in the different described embodiments like parts with same reference numerals and/or. same construction unit designations to be provided, whereby the disclosures in a general manner on like parts with same reference numerals, contained in the specification, and/or. same construction unit designations transfered to become to be able. Also are the situation data selected in the description, like z. B. , down above, lateral etc. on those immediate described as well as represented fig based and are corresponding during a change of situation on the new layer to transfered. Further also single characteristics or characteristic combinations of different embodiments shown and the described for itself can represent independent, inventive or solutions according to invention.

▲ top

In Fig. 1 is a sealing machine and/or. a welding set 1 for most diverse welding methods, like z. B. MIG/MAG welding and/or. TIG welding, or electrode perspiration en drives shown.

The welding set 1 covers a power source 2 with a service section 3, a control apparatus 4 and the service section 3 and/or. the control apparatus 4 associated switching member 5. The switching member 5 and/or. the control apparatus 4 is 6 connected, which in a supply line 7 for a gas 8, with a control valve, in particular a protective gas is as for example C02, helium or argon and such, between a gas memory 9 and a welding torch 10 arranged.

Besides still another feed device 11, which for MIG/MAG welding conventional is, can become driven over the control apparatus 4, whereby over a supply line 12 a welding wire becomes 13 of a Vorratstrommel 14 into the range of the welding torch 10 supplied. It is of course possible that the feed device is 11, like it from the state of the art known, in the welding set 1 integrated is and not, as in Fig. 1 shown, when attachment is formed.

The current for developing an arc 15 between the welding wire 13 and a workpiece 16 becomes over a supply line 17 of the service section 3 of the power source 2 the welding torch 10 and/or. the welding wire 13 supplied, whereby the workpiece which can be welded is likewise 16 over an other supply line 18 with the welding set 1, in particular with the power source 2, connected and thus over the arc 15 an electric circuit constructed can become.

The cool one of the welding torch 10 the welding torch 10 bottom interposition of a flow switch can become 20 with a coolant tank 21 connected over a cooling circuit 19, whereby with the start-up of the welding torch 10 the cooling circuit 19, in particular a liquid pump used for the liquid arranged in the coolant tank 21, can become started and thus a cooling of the welding torch 10 and/or. the welding wire 13 effected becomes.

The welding set I exhibits further Ein-und/or output device 22, over those the most different welding parameters and/or. Modes of the welding set 1 set to become to be able. Over Ein-und/or output device 22 set welding parameters passed on to the control apparatus 4 and by this the subsequent individual components of the sealing machine will become and/or. the welding set I driven.

Further is in the represented embodiment of the welding torches 10 over a hose package 23 with the welding set 1 and/or. the sealing machine connected. In the hose package 23 the single lines of the welding set 1 are 10 arranged to the welding torch. The hose package 23 becomes 10 connected over a connecting device ranking among the state of the art 24 with the welding torch, against what the single lines in the hose package 23 with the single contacts of the welding set 1 over connector sockets and/or. Plug connections connected are. So that a corresponding strain relief of the hose package is 23 ensured, the hose package is 23 over a strain relief device 25 with an housing 26 of

the welding set 1 connected.

Into the Fig. 2 to 7, in particular in Fig. 2, is in more simplified, schematic illustration the welding set I with the power source 2 shown. After this illustration the individual components of the service section 3 as well as the control apparatus are 4 integrated arranged in the welding set I. The power source 2 is over the supply lines 17.18 with the welding torch 10 and/or. the workpiece 16 connected. So that a control of the feed device 11 can take place, the control apparatus is 4 over control lines 27.28 with the feed device 11 connected. The feed device 11 points the Vorratstrommel 14 with the welding wire 13 and a driving device 29, z. B. formed by conveying rollers 30, 31, and a drive 32 up.

The formation of the arc 15 between the welding wire 13 and the workpiece 16 appended described procedure becomes by the control apparatus 4 controlled and monitored. The service section 3 is 33 line-connected after the embodiment shown with an external prefered regulated power source.

It is possible that a welding method becomes realized, with which from the control apparatus in response of the adjusting arc voltage an output signal the change of the feed direction of the welding wire generated becomes, whereby after the decrease of the arc voltage up and/or. a bottom process dependent predetermined minimum value the advancing movement stopped and/or a direction reversal of the advancing movement made, so that after an increase and reaching and/or. Exceed the target value of the arc voltage a recent direction reversal of the advancing movement made.

Into the Fig. 3 to 5 is now on the basis charts the correlation between wire feed motion, voltage and a possible regulated current process shown. Is in Fig. 3 the feed speed " Vd " of the welding wire 13 in response of the time “t”, which is applied on the abscissa of the diagram, shown. The waveform of the feed speed " Vd " in the range above the abscissa represents a forward movement of the welding wire 13 toward the workpiece 16 and the waveform below the abscissa a backward motion, which leads to a removal of the filler rod end of the workpiece 16. In the Fig. 4 the potential gradient is and in Fig. 5 the current process at the welding wire 13 shown with the waveform of the voltage U and the waveform of the current I.

With the represented welding method an ignition procedure for first igniting of the arc, known from the state of the art, becomes 15, as for example from the EP 0,904,883 A used, so that with this ignition procedure any longer one does not deal more in greater detail.

It is of course possible that other arbitrary ignition procedures, in particular for a short-circuit welding, known from the state of the art, used to become to be able. It is not necessary the fact that must become 13 performed for the first ignition of the arc 15 Vor-und backward motion of the welding wire, but that by simple supplies, thus via a forward movement of the welding wire 13, to take place, D knows the ignition. h. that for example high frequency igniting can become a likewise used.

A time 34 the welding process, in particular the ignition procedure, becomes started.

A forward movement of the welding wire becomes 13 introduced of the control apparatus 4. Simultaneous one becomes the power source 2 activated, so that a corresponding power supply of the welding wire becomes 13 constructed. To a time 35 a shortcircuit, D arises between the workpiece 16 and the welding wire 13. h. that the welding wire 13 on the surface of the workpiece 16 accumulated, so that the applied voltage at the welding wire 13 breaks down and the current begins to flow. This shortcircuit between the welding wire 13 and the workpiece 16 becomes 4 recognized, on which this introduces a reciprocating motion of the welding wire 13, of the control apparatus, thus wegung.

To a time 36 the welding wire takes 13 from the surface of the workpiece 16 off and the arc 15 becomes automatic ignited. This becomes 4 recognized of the control apparatus. The backward motion of the welding wire 13 can become for example continued to itself a corresponding, pre-setable arc-prolonged trains. After reaching the preset arc-prolonged becomes the backward motion of the welding wire 13 again into a forward movement reverse, how is this 37 apparent to a time. Simultaneous one becomes a current increase performed, so that a stable arc can become 15 constructed. To a time 38 a stabilization of the arc 15 occurs, whereby the ignition procedure of the arc is 15 completed and it can become started with the selected welding process. It is of course possible that the backward motion with waiving the shortcircuit terminated will and thus a forward movement of the welding wire becomes 13 constructed. The two before described times 36 and 37 would cover themselves.

After formation of the arc an arc voltage 39 adjusts itself 15 between the welding wire 13 and the workpiece 16, whose potential gradient of the control apparatus becomes 4 monitored. Simultaneous one the made Anspeisung with the welding current 40 over the power source, required for the welding process, 2 in a process dependent preset order of magnitude. Becomes with the represented embodiment in Fig. 5 a current process with a constant welding current held 40 shown, D. h. that for example a welding current set on the welding wire 13 becomes 40 held constant over the entire, accomplished welding process.

Starting from the time 38 the welding wire 13 becomes for example with a constant held, maximum, preset feed speed in accordance with waveform 41 toward the workpiece 16 moved. While this phase made melting on of the welding wire 13 and so that the formation of a Metalltropfens at the filler rod end, which becomes transfered into the molten bath by the surface tension present in the molten bath, whereby during the transition, how a time 42 shown, a shortcircuit formed becomes brief, D. h. that the welding wire 13 with the melted on Metalltropfen the surface of the workpiece 16 touched. This can recognize the control apparatus 4 therefore, the there corresponding waveform 43 in Fig. 4 the constructed arc voltage 39 at the welding wire 13 breaks down.

By the monitoring of the arc voltage 39 shortcircuit in the control apparatus 4 becomes a rule process the reversal of the driving device 29 of the feed device 11 for the welding wire 13 generated, by those the drive 32 a backward motion of the welding wire 13 in accordance with waveform 44, as in Fig with entry of the state. 3 starting from the time 42 shown, makes. This backward motion becomes so long continued, until the state shortcircuit is waived, D. h. that the welding wire 13 of the surface of the molten bath separates and thus the arc 15 again ignited becomes,

whereby thereby the arc voltage 39 resets itself starting from a time 45 of waiving the state shortcircuit.

During this backward motion, thus starting from the time 42, however the preset current process, in particular the welding current 40, is maintained, D. h. that performed with the formation of the shortcircuit no current increase for melt opens of the shortcircuit, how this with welding processes from the state of the art known is becomes. By the fact achieved becomes that a splash-free detachment of the Metalltropfens of the welding wire can become 13 ensured.

The detachment of the Metalltropfens made with the invention process so the fact that by the shortcircuit, thus by affecting the melted on Metalltropfens with the molten bath this due to the surface tension of the molten bath into the molten bath drawn becomes whereby the backward motion of the welding wire drips the peeling of the metal from the filler rod end of supported and thus a more rapid detachment of the Metalltropfens effected becomes. If the Metalltropfen of the filler rod end of dissolved has itself, then the shortcircuit is waived and a recent arc 15 becomes independent ignited, as is this 45 apparent to the time. Thereupon made again a reciprocating motion of the welding wire 13, D. h. that the filler rod movement of the backward motion becomes reverse into a recent forward movement, until again a shortcircuit arises, so that the before described steps repeat themselves.

By this type of the drop separation, in particular the Metalltropfens, achieved becomes the fact that a welding method for Zünd-und a welding process becomes provided, which complete runs off splash-free and thus post treatments can escape the surface of the workpiece 16. By the backward motion of the welding wire 13 achieved becomes that thereby the state shortcircuit is waived, without having to make thereby a corresponding current increase to the peeling of the Metalltropfens. With the described remark with play acts it here major around a so called short-circuiting arc welding, with that the materials handling in the short-circuit phase of the arc 15 made. It is however just as possible to use this welding method also for other welding processes.

A substantial advantage becomes achieved with this welding method that now even with thicker welding wires of 13 relatively small welds complete splash-free manufactured to become to be able and with thin welding wires 13 for example so called microweldings on very much thin sheets manufactured to become be able.

The way like the welding current 40 and the advancing movement of the welding wire 13 over process conditions controlled becomes, is arbitrary variable. It is also possible that simultaneous with the release of the shortcircuit does not become the filler rod movement reverse, but that the welding wire 13 is moved backward until a corresponding arc-prolonged adjusts itself and subsequent only the forward movement for other melt opens of the Metalltropfens introduced becomes. It can also for example the welding current 40, like schematic in the charts of the Fig. 6 and 7 shown, with any frequency pulsed become and the welding wire 13 to pulsing a movement toward the workpiece 16 accomplish in each case, to the Metalltropfen the molten bath touched. Process conditions shortcircuit resultant thereby become subsequent by a backward motion of the welding wire 14 dissolved, according to which with the stopping of the driving device 32 and/or. the reversal into the forces, which could affect the Metalltropfen from the arc 15 out centrifuges with larger welding currents and with use of C02 than protective gas and thus in sequence thereby arising welding splashes the welding result negative to eliminate.

In Fig. 6 is an embodiment with a pulsed current process shown. Ignition procedure becomes the welding current 40 held constant over a certain period 46 on a preset currenthigh after conclusion, so that a corresponding Metalltrop fen themselves at the filler rod end train can.

Since for example 16 constant with a robot sealing machine the distance of the welding torch is 10 to the surface of the workpiece, the single short-circuit times are known, so that for example lowering the welding current becomes 40 before the formation of a shortcircuit performed. So that the single short-circuit times fixed is to become to be able, it possible that first a corresponding test welding becomes performed, so that from the control apparatus 4 these times detected and stored to become to be able. It is of course possible that with known distance of the welding torch 10 to the surface of the workpiece 16 the control apparatus 4 can compute these times due to preset wire feed speed, so that from the control apparatus again the length of the period 46 can specify 4 for lowering the welding current 40 before the shortcircuit.

With the represented welding method in Fig. 6 thus the welding current 40 before the formation of a shortcircuit on a lower value lowered becomes, whereby achieved becomes that can to become 40 used for the formation of the Metalltropfens a substantial higher welding current and be able nevertheless no welding splashes to arise, since during developing the shortcircuit between the welding wire 13 and the workpiece 16 the welding current lowered becomes. With this welding method shown now the welding current becomes 40 held constant during the forward movement over a certain period 46 on a corresponding welding current-high, whereby after flow of this period 46 a decrease on a corresponding lower value made. The welding current 40 becomes subsequent up to the re-ignition of the arc 15 held constant on this lower value, D. h. that with the entry of the shortcircuit and the backward motion subsequent on it a constant welding current remains maintaining 40.

It is of course possible that the higher welding current 40 is maintained until that a shortcircuit arises and a subsequent decrease can become on the predetermined lower welding current value performed.

The advantage of a such method with a pulsed welding current 40 lies in the fact that the heating of the welding wire can become 13 small held, since only over a certain period 46 a significant current load affects the welding wire 13.

In Fig. 7 is again a welding method shown, 13 applied with which the welding current becomes mig 40 pulsför to the welding wire, like this in Fig. 6 described is. With this method however an other current pulse becomes 47 formed in the backward motion of the welding wire 13, thus after the formation of the shortcircuit. This current pulse 47 has to replace the object supporting the Metalltropfen, D. h. that due to this current pulse 47 a constriction becomes during the backward motion formed, so that an easier and faster peeling of the Metalltropfens of the welding wire becomes 13 achieved. With the fact it is possible that the height of this current pulse is more adjustable 47 free. The height of this current pulse 47 becomes a so selected that with a corresponding filler rod diameter no metal drop separation comes.

The formation and/or. the application of a current pulse 47 in the backward motion effected that additional energy in the Metalltropfen becomes introduced, so that no cooling and/or. an additional softening of the Metalltropfens performed becomes, which leads to a still easier detachment of the Metalltropfens. Further achieved that by the current pulse 47 the backward motion minimized becomes, D becomes. h. that the welding wire must become 13 no longer so strong backwards moved.

Is fundamental to the single represented methods of the Fig. to say 3 to 7 that, not as from the state of the art known, after which igniting the welding current 40 a constant forward movement of the welding wire 13 performed becomes, but that after a formation of a shortcircuit the forward movement interrupted will and into a backward motion reverse becomes. It is also possible that the forward movement becomes only interrupted one, D. h. that the wire feed motion becomes stopped over a certain period, thus no backward motion performed will and thus due to the welding current put on 40 and the surface tension of the molten bath a metal drop separation caused becomes.

The control of the before described methods can become also so dissolved, by for example wire feed speed arbitrary selected will and a corresponding current control or a reverse performed becomes, D. h. that the speed Vorwärts- und can become/or backward motion in response of the current or reverse controlled. This is therefore possible, there the control apparatus 4 the states of the shortcircuits to recognize can and thus a corresponding control of one both parameters, in particular the speed or the current, makes can. By the fact it is possible that the short-circuit frequency controlled and/or. fixed will can. By this control option it is necessary also not that wire feed speed fixed and/or. set or controlled will must.

By the fact it is possible that the frequency Vorwärts-und/or backward motion of the welding wire 13 synchronous or asynchronous and temporal delayed to the welding current 40 made given by the power source 2 or that the welding current 40 synchronous or asynchronous and temporal delayed becomes the frequency Vorwärts-und/or backward motion of the welding wire 13 to the welding wire 13 applied.

In the Fig. 8 is the feed device 11 existing from the Vorratstrommel 14 with the welding wire 13 and the conveying rollers 30.31 with the drive 32 shown. In order to reach an exact guide of the welding wire 13, the conveying rollers 30.31 provided with circumferential guide grooves 48.49 are. As drive 32 in particular a brushless, currentoperated servomotor 50 is suitable for the rapid change of direction of rotation required for the before-described welding process for causing forward of or the backward motion of the welding wire 13.

In the Fig. 9 is an other formation of the feed device 11 for the welding wire 13 shown. This is in type of a linear carriage device known from the state of the art 51 formed, which with grab pliers 52 to the detection of the welding wire 13 equipped is and which are more movable moving in opposite directions on a slide assembly 53 and alternately during the advancing movement stretch the welding wire 13 and move and with which also rapid steering round of the direction of movement possible is.

The drive 32 for such formed feed devices 11 knows both over linear engines electrical as well as however with a pressure medium applied drive elements, z. B. Cylinders 54, operated become.

Of course also according to invention a combination is possible, is 56 arranged with which a role impulse 55 on a reversible carriage device rapid in its direction of movement, whereby the carriage device 56 for a sensitive course of motion becomes for example 58 moved over a jackscrew actuator operated with a servomotor 57, like this in Fig. 10 schematically illustrated is. With this embodiment a direction of rotation reversal of the drive is 32 not required, there the reversals of the direction of movement of the welding wire 13 by the jackscrew actuator 58 made. It is also possible that the drive 32 of the linear carriage device is 51 formed by an eccentric cam drive.

In the Fig. 11 is on the basis a schematic diagram an other embodiment of the welding set according to invention 1 shown. The welding set I angespeiste by the power source 33 exhibits the service section 3 with the power source 2, the control apparatus 4, the feed device 11 for the welding wire 13 as well as the supply lines 17.18 as well as the welding torch 10 for the execution of the welding process on the workpiece 16.

In a supplying circle 60 formed by lines 59 for the drive 32 is switching means 61, z. B. to steering round the drive 32 z. B. the servomotor 50, provided. Further the control apparatus 4 exhibits a control circuit 63 formed by a target actual being 62, that from an evaluation circuit 64, which detects the arc voltage, applied becomes. The evaluation circuit 64 and the target actual being 62 form a diagnostic circuit 65 with the control circuit 63 to the application of the switching means 61.

In the evaluation circuit 64 the voltage change at the arc becomes 15 permanent determined, whereby prefered becomes by means of a timer 66 the voltage change in a predetermined unit time determined and in the diagnostic circuit 65 of a rule function at the basis placed. Thus it is now possible, the drive of the drive 32 of the feed device 11 in response of the voltage change of the arc 15 and in Abhän gigkeit deposited parameter of the target actual comparator 62 to accomplish and the welding wire 13 toward the workpiece 16 with a regulated feed speed to promote. With detection of a voltage drop countermeasures are by steering round the drive 32 and thus the reversal of the welding wire 13 in fractions of seconds possible, whereby a short-circuit state with its negative effects like a “sticking " of the welding wire 13 become avoided together effective at the workpiece 16 and/or “welding splashes ".

The embodiment of the apparatus those the wire electrode forward of and/or backwards moved, can take place and on all only erdenklichen possibilities the periphery which it identification.

So the wire drive can by means of two rollers, which exhibit a groove, in which the wire guided becomes the example, to take place. These rollers become for example driven of a brushless servomotor, which is specified for very rapid changes of direction of rotation.

Further a drive would be by means of a grab mechanism more conceivable or however a role on floated, which on a carriage mounted is, whereby by the carriage the Richtungsände rungen of the wire electrode, in particular the welding wire, is made.

The wire drive unit should itself with the described embodiments very close at the welding torch, in particular at the torch point, finds, since responsive made to the movement of the wire drive with larger removals the movement at the torch point cannot become due to the clearance in the wire feed soul delayed and thus any longer corresponding rapid on process conditions.

It knows however also the wire feed motion, thus Vorwärts-und/or backward motion, by the relative movement of the welding torch 10 to the workpiece 16, which is for example fixed on a linear carriage, takes place, whereby then the wire feed control the welding wire with constant speed after forwards, thus toward the workpiece 16 and/or. the molten bath, to promote and the wire drive can be more immediate at the weld does not have. The wire drive does not need to be able to implement also in this case a backward motion.

It must become still held that the before described, procedure according to invention like also the apparatus according to invention both with a manual welding process as well as by machine accomplished welding processes, z. B. in particular at welding robots, are more applicable. Final one is pointed out that enlarged shown in the before described embodiments individual parts became unproportional, in order to improve the understanding of the solution according to invention. The other also individual parts of the before described characteristic combinations of the single embodiments in connection with other single characteristics from other Ausfüh can rungsbeispielen, form independent, solutions according to invention.

Above all the single in the Fig can. 1 ; 2 ; 3,4,5,6,7,8,9; 10,11 Ausfüh shown rungen the subject-matter of independent solutions according to invention form. The related objects and solutions according to invention are to be taken from the descriptions of detail of these figs.

Reference symbol list welding set 41 waveform 2 power source 42 time 3 service section 43 waveform 4 control apparatus 44 waveform 5 switching member 45 time 6 control valve 46 period 7 supply line 47 current pulse 8 gas 48 guide groove of 9 gas memory 49 guide groove of 10 welding torches 50 servomotor 11 feed device 51 linear carriage device 12 supply line 52 grab pliers 13 welding wire 53 slide assembly 14 Vorratstrommel of 54 cylinders 15 arcs 55 role impulse 16 workpiece 56 carriage device 17 supply line 57 servomotor 18 supply line 58 jackscrew actuator 19 cooling circuit 59 line of 20 flow switches 60 supplying circle of 21 coolant tanks of 61 switching means 22 Ein-und/or output device of 62 target actual being 23 hose package 63 control circuit 24 connecting device 64 evaluation circuit 25 strain relief device 65 diagnostic circuit of 26 housings 66 timer 27 control line 28 control line 29 driving device 30 conveying roller 31 conveying roller 32 drive 33 Power source 34 time 35 time 36 time 37 time 38 time 39 arc voltage 40 welding current